

Atty. Docket No. CA1055
PATENT APPLICATION

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No. 09/556,349

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Original) A method for summarizing a content of an input video sequence, said input video sequence comprising a plurality of frames, said plurality of frames being grouped into a plurality of video segments, said method comprising:

(a) selecting a frame cluster in said input video sequence which corresponds to a most static one of said video segments;

(b) computing a content value in said selected frame cluster;

(c) using said computed content value to cluster remaining frames in said input video sequence.

2. (Original) The method of claim 1, wherein in said (a) said frame cluster is selected using a refined feature space representation of said input video sequence.

3. (Original) The method of claim 1, wherein in said (a) each of said plurality of frames is transformed into a histogram vector indicative of a spatial distribution of colors in said each of said plurality of frames.

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4. (Original) The method of claim 3, wherein in said (a) each of said plurality of frames is divided into a plurality of blocks, each of said plurality of blocks being represented by a histogram in a color space indicative of a distribution of colors within each of said plurality of blocks.

5. (Original) The method of claim 3, wherein each of said plurality of frames is divided into a plurality of blocks and each said histogram vector comprises a plurality of histograms in a color space, each of said plurality of histograms corresponding to one of said plurality of blocks.

6. (Original) The method of claim 2, wherein said refined feature space representation is obtained using a singular value decomposition of said input video sequence.

7. (Original) The method of claim 6, wherein said singular value decomposition is performed using frames selected with a fixed interval from said input video sequence.

8. (Original) The method of claim 7, wherein said selected frames are arranged into a feature frame matrix, and wherein said singular value decomposition is performed on said feature frame matrix.

9. (Original) The method of claim 6, wherein said singular value decomposition produces a matrix, each column of said matrix representing a frame in a refined feature space corresponding to a frame in said input video sequence.

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10. (Original) The method of claim 1, further comprising (d) using said clustered frames to output a motion video representative of a summary of said input video sequence.

11. (Original) The method of claim 1, further comprising (d) outputting a plurality of keyframes, each of said plurality of keyframes representative of said clustered frames.

12. (Original) The method of claim 2, wherein said selecting comprises locating a cluster closest to an origin of said refined feature space.

13. (Original) The method of claim 2, wherein said (c) comprises:

(c)(1) sorting a plurality of vectors in said refined feature space in ascending order according to a distance of each of said vectors to an origin of said refined feature space representation;

(c)(2) selecting a vector among said sorted vectors which is closest to an origin of said refined feature space representation and including said selected vector into a first cluster;

(c)(3) clustering said plurality of sorted vectors in said refined feature into a plurality of clusters according to a distance between each of said plurality of sorted vectors and vectors in each of said plurality of clusters and an amount of information in each of said plurality of clusters.

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14. (Original) The method of claim 13, wherein in said (c)(3) said plurality of sorted vectors are clustered into said plurality of clusters such that said amount of information in each of said plurality of clusters does not exceed an amount of information in said first cluster.

15. (Original) The method of claim 13, wherein said first cluster is composed of frames based on a distance variation between said frames and an average distance between frames in said first cluster.

16. (Original) The method of claim 13, wherein each of said plurality of clusters is composed of frames based on a distance variation between said frames and an average distance between frames in said each of said plurality of clusters.

17. (Original) A method for summarizing a content of an input video sequence, said method comprising:

- (a) selecting frames from said input video sequence, said selected frames being taken at a fixed interval;
- (b) creating a feature frame matrix using said selected frames;
- (c) performing a singular value decomposition on said feature frame matrix to obtain a matrix representing said video sequence in a refined feature space;
- (d) selecting a cluster in said refined feature space corresponding to a most static video segment;
- (e) computing a content value corresponding to said selected cluster;

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(f) using said computed content value to cluster frames in said input video sequence.

Claims 18-30. (Cancelled).

31. (Original) A computer-readable medium containing a program for summarizing a content of an input video sequence, said input video sequence comprising a plurality of frames, said plurality of frames being grouped into a plurality of video segments, said program comprising:

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- (a) selecting a frame cluster in said input video sequence which corresponds to a most static video segment;
 - (b) computing content value in said selected frame cluster;
 - (c) using said computed content value to cluster remaining frames in said input video sequence.

32. (Original) The computer-readable medium of claim 31, wherein in said (a) said frame cluster is selected using a refined feature space representation of said input video sequence.

33. (Original) The computer-readable medium of claim 31, wherein in said (a) each of said plurality of frames is transformed into a histogram vector indicative of a spatial distribution of colors in said each of said plurality of frames.

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34. (Original) The computer-readable medium of claim 33, wherein in said (a) each of said plurality of frames is divided into a plurality of blocks, each of said plurality of blocks being represented by a histogram in a color space indicative of a distribution of colors within each of said plurality of blocks.

35. (Original) The computer-readable medium of claim 33, wherein each of said plurality of frames is divided into a plurality of blocks and each said histogram vector comprises a plurality of histograms in a color space, each of said plurality of histograms corresponding to one of said plurality of blocks.

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36. (Original) The computer-readable medium of claim 32, wherein said refined feature space representation is obtained using a singular value decomposition of said input video sequence.

37. (Original) The computer-readable medium of claim 36, wherein said singular value decomposition is performed using frames selected with a fixed interval from said input video sequence.

38. (Original) The computer-readable medium of claim 37, wherein said selected frames are arranged into a feature frame matrix, and wherein said singular value decomposition is performed on said feature frame matrix.

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39. (Currently Amended) The computer-readable medium of claim ~~33~~ 36, wherein said singular value decomposition produces a matrix, each column of said matrix representing a frame in a refined feature space corresponding to a frame in said input video sequence.

40. (Original) The computer-readable medium of claim 31, further comprising (d) using said clustered frames to output a video representative of a summary of said input video sequence.

41. (Original) The computer-readable medium of claim 31, further comprising (d) outputting a plurality of keyframes, each of said plurality of keyframes representative of said clustered frames.

42. (Original) The computer-readable medium of claim 32, wherein said selecting comprises locating a cluster closest to an origin of said refined feature space.

43. (Original) The computer-readable medium of claim 32, wherein said (c) comprises:

(1) sorting a plurality of vectors in said refined feature space in ascending order according to a distance of each of said vectors to an origin of said refined feature space;

(2) selecting a vector among said sorted vectors which is closest to an origin of said refined feature space and including said selected vector into a first cluster;

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(3) clustering said plurality of sorted vectors in said refined feature into a plurality of clusters according to a distance between each of said plurality of sorted vectors and each of said plurality of clusters and an amount of information in each of said plurality of clusters.

44. (Currently Amended) The computer-readable medium of claim 38 43, wherein in said (3) said plurality of sorted vectors are clustered into said plurality of clusters such that said amount of information in each of said plurality of clusters does not exceed an amount of information in said first cluster.

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45. (Currently Amended) The computer-readable medium of claim 38 43, wherein said first cluster is composed of frames based on a distance variation between said frames and said first cluster.

46. (Currently Amended) The computer-readable medium of claim 38 43, wherein each of said plurality of clusters is composed of frames based on a distance variation between said frames and said each of said plurality of clusters.

47. (Original) A computer-readable medium containing a program for summarizing a content of an input video sequence, said program comprising:

- (a) selecting frames with a fixed interval from said input video sequence;
- (b) creating a feature frame matrix using said selected frames;

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- (c) performing a singular value decomposition on said feature frame matrix to obtain matrix representing said video sequence in refined feature space;
 - (d) selecting a cluster in said refined feature space corresponding to a most static video segment;
 - (e) computing a content value corresponding to said selected cluster;
 - (f) using said computed content value to cluster frames in said input video sequence.

Claims 48-72. (Cancelled).
